



how to build a gas forge burner

by [makingcustomknives](#) on July 5, 2011

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Intro: How to build a gas forge burner

First and Foremost, This burner was designed by Mr. Ron Reil. All credit for this design goes to him. Visit Ron Reil's page at the link below:

<http://ronreil.abana.org/design1.shtml>

Also, Fire is Hot. A burner like this puts out a significant amount of heat and using such a device improperly is likely to cause you injury and/or property damage. I suggest you use good safety procedures building and operating this burner, BUT AM NOT RESPONSIBLE FOR YOUR ACTIONS OR CHOICES NOR AM I RESPONSIBLE FOR ANY DAMAGE OR INJURY THAT MAY RESULT FROM YOU BUILDING AND USING THIS DEVICE.

There are countless designs for forge burners and furnace burners online. I like this one because it is simple to construct, and the materials are easily obtainable from most hardware stores.

This burner was built for [this small forge](#) . The forge is small enough that I can run the burner at under 5 psi and keep the interior at a good working temperature. However, this burner design does work well in larger forges, many large forges even use multiple burners.

In order to build this forge burner, You will need a drill, a set of bits, and a couple of files. If you don't have a tap to install the set screws, there is an alternate method that I will address at the end of this article. Also, in order to forge the flare for this burner, you will need a functional forge already, or another heat source. If this is your first forge, there is obviously going to be a problem here. The alternate method for this too will be at the end of the article.

Also, it is important to note that you will need a gas regulator to run this burner. Simply running a hose from the burner assembly to your propane tank is not going to cut it. Regulators can be purchased locally at welding supply stores.



Image Notes

1. business end



Step 1: TOOLS AND MATERIALS

MATERIALS

The main burner assembly is made from black iron pipe fittings. I bought all of these off the shelf at Lowe's. DO NOT use galvanized fittings as they will produce toxic fumes when heated.

The brass fittings are all 1/8". The 4" nipple, coupler and end cap on the left make up the segment that is installed into the intake of the burner. The rest of the fittings serve to distance the hose connection from the heat of the burner, and can be constructed in any configuration you want.



Image Notes

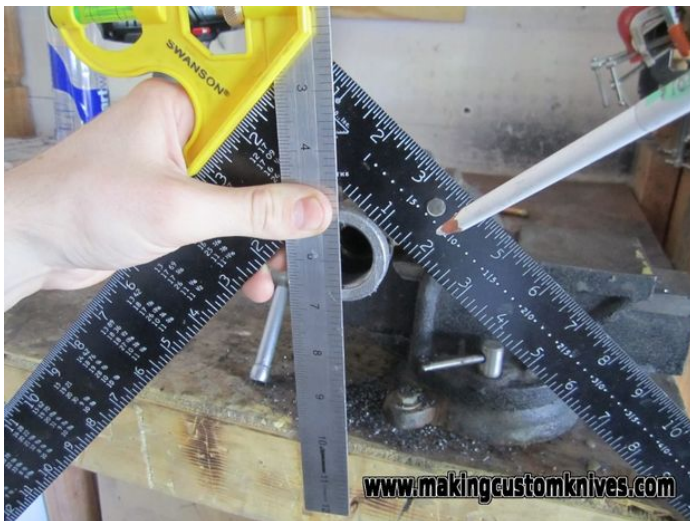
1. This will become the flare.

Step 2: BURNER INTAKE 1

BURNER INTAKE

The first task is to fit the 4" brass nipple perpendicularly through the wide opening of the bell reducer. For the burner to perform optimally, the tube needs to be centered through the intake. It doesn't have to be perfect, but it does need to be close. I marked out a center line on the face of the reducer using a carpenter's square and a combination square as shown in the picture.

After marking the center line on the face of the burner intake (bell reducer), extend the lines down the side of the reducer. Then place the 1/8" brass nipple against the wide rim of the reducer and mark across the center line where its approximate center is. Transfer this line to the opposite side with the combination square.





Step 3: BURNER INTAKE 2

Before drilling the hole for the 1/8" brass nipple, I align the center marks with the jaws of the vice to help me in orienting the drill bit. First drill a pilot hole through the "X" that we marked on the side of the reducer. Then I drill through with a 3/8" bit.

Use a round file to allow the brass nipple to fit through both holes.



Step 4: BURNER INTAKE 3

Now that the gas tube fits through the intake of the burner, we need to find a way to secure it into position. During usage, the orifice must be pointing directly down the burner tube to burn correctly. To do this, we will install a set screw to keep the tube from rotating.

If you have never used a set screw before, the process consists of drilling a hole, then using a tap to cut threads into the sides of the hole so that the appropriate screw will fit inside.

The hole is easy enough to drill by hand, just pay attention to the angle you are drilling through the wall of the reducer. It is a slight inward angle toward the smaller opening of the reducer. I used a size 8/32 tap/screw which is drilled with a 9/64" drill bit. You can go smaller than this if you want, but I would suggest you do not go any larger, as it would be easier to cut through the wall of the reducer.



Step 5: ORIFICE

ORIFICE

The burner orifice is drilled with a #57 drill bit. As with the positioning of the gas tube, it is important that the hole is centered. I mark a line down the length of the 4" nipple to help me gauge by eye where the center is. Smaller drill bits are pretty fragile, so if you are drilling by hand like I am, be careful not to apply too much force. Just let the bit do the work.

IMPORTANT: Make sure that the orifice is pointed down the burner tube (small end of reducer) before using the burner. I had mine position upward with the setscrew tightened because it was easier to hold it in the vice. **MAKE SURE THAT YOU POINT THE ORIFICE DOWN THE BURNER TUBE BEFORE USAGE.**



Step 6: Flare

FLARE

With the help of the funnel shaped burner intake, the mirrored funnel of the flare at the burner's tip helps to create the vacuum effect known as "venturi".

The flare is made from a 3" segment of 1" pipe that slides over the end of the 3/4" burner tube. After heating the 3" segment to a red heat, I hammer the rim of the pipe against a piece of round bar, rotating the pipe as I work. The flare should expand out to around 1 1/2" at the opening. I recommend putting a set screw in flare as well, to provide a wider range of adjustments for your burner.





Step 7: Assembly

Assembly

To orient the orifice, I took my #57 bit and inserted it, shank first, into the hole. Using the bit as a pointer, I directed it out of the SMALL end of the reducer (down the burner tube) and centered it as well as I could before tightening the set screw. It may take some more adjusting, but that is a good place to start.

As I said before, the fixtures coming off off the 4? brass nipple (gas tube) serve primarily to distance the rubber gas hose from the heat of the burner and forge, so you can use whatever configuration you want. The last fitting on the brass assembly is a 1/8? to 1/4? bushing which attaches to a LP gas hose which attaches to a regulator running off a 20lb propane tank.

Conclusion.

I do not claim to be an expert on much of anything, but specifically on forges. My authority on these subjects is that I have successfully done what I am talking about, and I am willing to take the time to document my experience and produce article, videos, and instructions to the best of my ability so that others can overcome obstacles that I have met. I am always open to advice from the many, many folks who know how to do this stuff better than I do, and I am always happy to give advice to anyone who asks.

So, for more honest to goodness instruction on forges, knifemaking, and metalworking, Check out my website at the link below:

www.makingcustomknives.com

Thanks for reading.





Image Notes
1. business end

Step 8: Alternatives - Set screws

ALTERNATIVES

In section I will talk about work-arounds for certain parts of this forge burner. The first is the set screw. If you do not have a tap set, you need to use another method to secure the gas tube. To substitute the setscrew, you can use the threaded end of a 1" pipe segment screwed into the intake (bell reducer). Just tighten down the 1" pipe against the tube to keep it in place. The disadvantage to this is that it narrows the intake, and therefore decreases the amount of air in the fuel mixture. This isn't necessarily a bad thing, just something to remember.



Step 9: Alternatives - forged flare

Next, in order to forge the flare, you will need to already have a working forge. The alternative to the forged flare, is to simply not forge the flare. Using a 3" piece of 1" pipe over the burner tube will create the vacuum or "venturi" effect when. The "disadvantage is the same as before, it will not draw quite as much oxygen into the mix.



Related Instructables



How to Build a Forge (Gas) by makingcustomknives



Forge / Furnace Propane Jet Burner by n1cod3mus



How to build a better forge (video) by makingcustomknives



How to Build a Forge (video) by makingcustomknives



Blow Dryer and Red Brick Aluminum Forge by egbertfitzwilly



How to Make a Soup Can Forge (video) by NightHawkInLight

Comments

39 comments [Add Comment](#)



Blacksmithier says:

Does it fit to my gas forge <http://devil-forge.com/gas-forges/DFPROF1?>

Jan 30, 2014. 2:28 PM [REPLY](#)



lovegrove says:

How safe is this burner and what fittings do you use from the burner to the gas bottle

Jan 29, 2014. 11:30 AM [REPLY](#)



Truehart says:

Could this burner or your other propane torch method be used with this forge: <http://www.instructables.com/id/How-To-Make-A-Bladesmiths-Forge/> ?

Mar 26, 2012. 7:17 AM [REPLY](#)

Also, does propane burn hot enough to reform a leaf spring from a vehicle?



Grimmiger says:

Would not work for this type of open forge.
These require coal to heat up a large surface.
Whereas this method is more like an oven building and maintaining heat in a small area.

Jul 26, 2013. 3:21 AM [REPLY](#)



the_burrito_master says:

what kind of brass fitting do i need to go from a 1/8 inch pipe to this hose it says it's a 1/8 inch fitting with orifice does that mean it has a valve that must be connected into a specific fitting or can I just use a 1/8 inch coupling?

Apr 28, 2013. 1:22 PM [REPLY](#)

bspecter says:

Great build! I have been thinking about getting away from coal for years but I live out in the country where we have no gas lines.

Oct 22, 2012. 9:55 AM [REPLY](#)

Anyone know how long this burner will run on a standard 40lbs bbq tank?



Kaiven says:

Jan 8, 2012. 10:26 AM [REPLY](#)

My burner created a nice double flame and heated a soup can to red hot within seconds. But somehow, it doesn't do that anymore and it just shoots out a single flame that barely heats anything. Could this be a problem with my oxygen/gas ratio that isn't creating the torch effect? Is this a fixable issue?

I found out that my first trials didn't work because the gas can was very low on pressure. I used a new one, but the inner cone flame went away after a few minutes. If I have to always maintain high pressure, what would be the best way...? Smaller pilot hole?



makingcustomknives says:

Jan 8, 2012. 2:51 PM [REPLY](#)

What color is the flame after the inner cone disappears? If there is not enough oxygen in the mix, the flame will become orange, so if you use a smaller orifice you may be able to run it at a lower pressure. Also, experiment with the placement of the flare on the main tube to find where the best gas ratio is created.



Kaiven says:

Jan 9, 2012. 8:33 AM [REPLY](#)

There is plenty of oxygen, I added holes near the back with a breach to control the extra air input. Every three times the inner flame did appear, it was blue (cyan I suppose?)

I added length to the burner temporarily with PVC and still got no inner flame. Same for when I pushed the flare all the way back on the burner.

The last combination I can think of is making a new, small pilot hole (again) and using a longer flare combo (maybe shorter too)....

I've invested \$100 on everything, \$40 on the burner, so I really want this to work. Last time I lost \$90 on an unsalvageable project, I was sad.



Kaiven says:

Jan 9, 2012. 10:26 AM [REPLY](#)

The pilot hole was slanted.... I fixed it and it works fine now.

Thanks for the instructions, this is exactly what I needed for my forge.



makingcustomknives says:

Jan 9, 2012. 2:29 PM [REPLY](#)

Great, I am glad it worked out for you.



Kaiven says:

Jan 14, 2012. 2:47 PM [REPLY](#)

I finally got a video of the burner in action, best investment yet! <http://www.youtube.com/watch?v=E6JnaTRnmPk>



makingcustomknives says:

Jan 16, 2012. 12:51 PM [REPLY](#)

Looks great dude. Thanks for linking to my site too. Have fun.



makingcustomknives says:

Jan 9, 2012. 10:37 AM [REPLY](#)

"Last time I lost \$90 on an unsalvageable project, I was sad."

I know the feeling brother. But before you go buy any more parts, try heating some steel scraps with the burner as it is. Even though the flame is not tight and uniform, if you point it inside an insulated enclosure, (a forge) it is going to get very hot. Over time, my burner flare is gradually oxidizing and changing the airflow of the burner. When I run it outside of the forge, the flame is wide and fluffy, but it still keeps my forge hot enough for work. Remember that you won't be able to see that pretty double flame cone when it's inside your forge anyway.



Kaiven says:

Jan 9, 2012. 12:37 PM [REPLY](#)

Hehehe, I finally got the double flame (though not uniform and pretty). Heats up rebar pretty red/orange and I already tempered a tool for my friend. We also melted aluminum and we were going to make ingots, but got rained out.



cool2000 says:

Dec 6, 2011. 4:14 PM [REPLY](#)

do you need to bell out the end or can you just leave it straight



curvy77 says:

Dec 3, 2011. 10:58 AM [REPLY](#)

....is this really a forge or is this A FREAKIN JET ENGINE!?! THIS IS AWESOME!

HanzieO says:

Sep 9, 2011. 2:36 PM [REPLY](#)

Very nice indeed. Thanks I made one and am happily on the road to amateur blacksmithing. I have made a 9kg propane tank forge with your burner and a homemade anvil. I have made 2 knives and a couple of couillard handles so far.

This burner is very simple to make and works very well.

Great photos as well.



poppamies says:

Aug 19, 2011. 1:05 PM [REPLY](#)

can I use this burner designed in forge welding? does this give me enough heat?

- 

gary.918 says:
again very good .

Aug 19, 2011. 6:39 AM [REPLY](#)
-
- 

Unbending Metal says:
Great job!

Aug 11, 2011. 1:05 PM [REPLY](#)
- Could this be adapted to use natural gas in place of propane? I don't like to refill the propane tanks and have access to natural gas.
-
- 

mutantpoptart says:
Great burner, I use one for Raku firing my pottery.

Jul 21, 2011. 12:39 PM [REPLY](#)
-
- 

Ericc815 says:
Burning petroleum products mixed with air in an open atmosphere is a barrel full of variables... Your question needs more specifics and identify which efficiency you have in mind.

Jul 7, 2011. 12:00 PM [REPLY](#)
-
- 

drewgrey says:
This is a top notch instructable and a great looking forge. Stoichiometric ratio is what I was wondering about specifically ,not that I see any fault in this design, I'm just curious if anyone has tested it side by side with a forge with a injector that moves in and out for tuning the venturi?

Jul 7, 2011. 8:19 PM [REPLY](#)
-
- 

makingcustomknives says:
I imagine that having a burner like that would give you a greater ability to alter air intake and better control the atmosphere of the forge.

Jul 10, 2011. 11:16 PM [REPLY](#)
-
- 

drewgrey says:
That's what I'm wondering. I also have wondered if a clever person could monitor the burnt gases with an o2 sensor. The gas would have to be drawn off and cooled to levels equal to a car exhaust but it would be a good project for a school.

Jul 11, 2011. 4:57 PM [REPLY](#)
-
- 

Ceiling cat says:
How much thrust does it put out?

Jul 5, 2011. 10:24 PM [REPLY](#)
-
- 

nanosec12 says:
It's not THAT kind of a burner....this one is used to heat a forge for working metal, not for pushing a vehicle

Jul 7, 2011. 6:12 AM [REPLY](#)
-
- 

Ceiling cat says:
lol I was joking. :)

Jul 10, 2011. 10:52 AM [REPLY](#)
-
- 

Old Nubbins says:
Whatever PSI your regulator is set to.

Jul 6, 2011. 1:30 PM [REPLY](#)
-
- 

makingcustomknives says:
Precisely.

Jul 6, 2011. 4:35 PM [REPLY](#)
-
- 

Mugai says:
Greetings, Nicely done. Looks quite usable and the instruction is complete and clear enough to actually make the beastie, My first thought is to use one as the burner for a small foundry.

ANY suggestions, hints, etc, will be appreciated.

Jul 7, 2011. 6:35 PM [REPLY](#)
-
- 

makingcustomknives says:
Well Thank you for your kind words.

As for the foundry, If I were trying to make a foundry, I would cut open the top of a 16oz propane bottle, and insulate it in the same manner as this propane bottle forge. Also, I would be careful not to point the burner directly at the crucible, but into the edge of the forge so that the heat radiates around the crucible in a circle.

Jul 8, 2011. 9:32 AM [REPLY](#)
-
- 

drewgrey says:
The setup you use obviously works great but I wonder if it is as efficient as the style (like mine) where you can adjust both the gas pressure and the point in the venturi where the gas is injected. Has anyone ever done a head to head test ?

Jul 6, 2011. 9:22 PM [REPLY](#)



uuglypher says:

Jul 7, 2011. 6:55 PM [REPLY](#)

I couldn't count how many instructables I've read, but this one should at the top of the paradigms of how they should be conceived, contrived, and produced. Simply a super job! I had more than a few misgivings about building and using a forge, but you've made it clear that the process is definitely within my capabilities. Many thanks for an exceptional Instructable.



WhyKnoT says:

Jul 7, 2011. 7:11 AM [REPLY](#)

I have viewed many different "instructable's" on this site, and elsewhere. This is one of the absolute best!

It clearly and concisely written, and very well illustrated.

Furthermore, the photos show the skill which you are blessed with; they also demonstrate that one only requires relatively simple tools, and determination, to effect a fine project.

I look forward to studying your website.

Thank You!



makingcustomknives says:

Jul 7, 2011. 5:07 PM [REPLY](#)

Thank you very much for your support.

madbastard says:

Jul 7, 2011. 1:52 PM [REPLY](#)

Larry Zoeller sells SS flared ends for this type of burner. And for Drewgrey, The injector can be adjusted by using the set screw to move it up or down. I made two of these burners and they work great at 2-3 Lbs. of pressure, I can heat a RR spike to forging temp in less than two minutes. Larry Zoeller also sells hoses and regulators for them. His web site is: <http://zoellerforge.com/>



jj2k says:

Jul 7, 2011. 6:31 AM [REPLY](#)

Nice instructable on a really good burner design. I have used this design for the past 12 years and have never had any issues with it.
